

REMARKS

The application has been amended to place the application in condition for allowance at the time of the next Official Action.

A replacement drawing is submitted for Figure 25 changing reference numeral 11 on the far right of the figure to reference numeral 21 to indicate the  $n^+$  part of trigger element 310 as disclosed on page 27, lines 14-18 of the application as filed. This represents the only change to the drawings, and is believed not to introduce new matter.

The title has been changed to "ESD Protection Apparatus for Discharging Electric Charge in a Depth Direction" and is believed to address the objection to the specification noted in the Official Action.

Claims 73-75 and 77-85 are pending in the application. Claims 80-85 are withdrawn from consideration as being directed to a non-elected species.

Claims 74 and 75 are amended to change the term "transistors" to "transistor". In addition, claim 75 is amended to clarify that the plural bipolar transistor refers to the plural vertical bipolar transistor. Accordingly, the claim objection as to claims 74 and 75 is believed addressed and should be withdrawn.

Claims 73-79 are rejected under 35 USC §112, first paragraph, as failing to comply with the written description requirement. This rejection is respectfully traversed.

Claim 73 provides that accumulated electric charge of the pad is discharged from a surface layer of the semiconductor substrate towards a depth direction of the semiconductor substrate. Although such phrase is not identically recited in the specification, there is no requirement that identical phrases be found in the claims and in the specification.

Rather, as set forth in MPEP §2163, to satisfy the written description requirement, a patent specification must describe the claimed invention in sufficient detail that one skilled in the art can reasonably conclude that the inventor had possession of the claimed invention. See, e.g., *Vas-Cath, Inc. v. Mahurkar*, 935 F.2d at 1563, 19 USPQ2d at 116.

Page 16, lines 1-6 of the present application disclose that electric charge attributed to the static electricity accumulated in the input terminal 6 is released in the longitudinal direction of the silicon substrate. As a result, electric current concentration can be prevented and a high ESD withstand level can be obtained.

Applicant asserts that one of ordinary skill in the art would understand that release of electrostatic charge attributed to the static electricity accumulated in the input terminal 6 (PAD of Figure 25) in the longitudinal direction of the silicon

substrate is discharging accumulated electric charge of a pad from a surface layer of a semiconductor substrate toward a depth direction of the semiconductor substrate as recited.

Accordingly, the above-noted passage describes the claimed invention in sufficient detail that one skilled in the art can reasonably conclude that the inventor had possession of the claimed invention. Therefore, the written description requirement is believed satisfied and the rejection under 35 USC §112, first paragraph should be withdrawn.

Claims 73-79 are rejected under 35 USC §112, second paragraph, as being indefinite. This rejection is respectfully traversed.

As to claim 73, as set forth above, page 16, lines 1-6 of the application as filed disclose that the electric charge is released in the longitudinal direction of the silicon substrate. Accordingly, the collector electrodes are led out through a collector-connection from a surface of the substrate through the substrate towards the depth direction of the semiconductor substrate as recited.

MPEP §2173.02 provides that definiteness of claim language must be analyzed, not in a vacuum, but in light of:

- a. the content of the particular application disclosure;
- b. teachings of the prior art; and

c. the claim interpretation that would be given by one in possession of ordinary level of skill in the pertinent art at the time the invention was made.

Applicant asserts that in reviewing the claims for compliance with 35 USC §112, second paragraph, when the claim is considered as a whole, the claim apprises one of ordinary skill in the art of its scope, and therefore serves the notice function required by 35 USC §112, second paragraph.

Claim 75 is amended to clarify that the separate collector layers 17 are formed simultaneously as shown in Figure 25 and as disclosed on page 16, lines 22-28, for example.

As to claim 77, this claim is also amended and clarifies that the anode and the cathode are insulated in a region of a second conductive type that is simultaneously formed with the collector of the transistor. Figure 25 shows the cathode 21 and anode 22 are insulated in n type conductivity region 27. As disclosed on page 18, lines 3-10, collector N wells 17 are formed and at that time N wells 27 of the trigger element 310 are simultaneously formed. Based on the amendment to claim 77 and the above disclosure, it is clarified that the region of a second conductivity type (27) is simultaneously formed with the collector (17) of the transistor.

In view of the above, it is believed that the rejections under 35 USC §112, second paragraph to claims 73-79 should be withdrawn.

Claims 73-79 are rejected as unpatentable over IWAI et al. 5,648,676 in view of LI et al. 5,623,387. This rejection is respectfully traversed.

Claim 73 is amended to include the subject matter of claim 76 and includes a trigger device for switching a vertical bipolar transistor of an ESD protection device using an application of an overvoltage as a trigger.

The Official Action offers LI et al. as teaching this feature. However, no motivation is offered for combining the references in the manner suggested as to this feature and applicant asserts that no motivation is found in the references. Rather, these references teach two disparate methods for ESD protection and one of ordinary skill in the art would not be motivated to combine the teachings of these references.

IWAI et al. use a C-B short-circuited device as an ESD protection device wherein the collector and base are short-circuited to each other as seen in Figure 1(a), for example. As disclosed on column 3, lines 20-23 of IWAI, the C-B short-circuited protective element improves a withstand voltage of a pn junction. As set forth on column 5, lines 7-15 of IWAI, since the diffusion layer 27 of the protective element 14 is deeper than the emitter diffusion layer 23 of the bipolar transistor 18, a larger side face of the diffusion layer 27 occurs. This larger side face of the diffusion layer 27 reduces a current density at the side face, to thereby increase the withstand voltage of the

protective element 14. Accordingly, IWAI reduces a current density at a pn junction to improve a withstand voltage.

In contrast, LI et al. teach at column 8, lines 15-31 to use a Zener diode to turn a transistor on at a lower voltage so that the transistor is turned on early. The early turn-on provides greater protection of the IC from excessive voltage buildup during an ESD event.

As seen in Figure 5B of LI et al., for example, diode Z124 is between the base region (beneath field oxide 306b) and collector 305. In the device of IWAI, the base and collector are short-circuited together. It is not apparent, therefore, where the diode of LI et al. would be used in the short-circuited device of IWAI.

Moreover, MPEP §2143.01 provides that the mere fact the references can be combined or modified does not render the resultant combination obvious unless the prior art also suggests the desirability of the combination. *In re Mills*, 916 F.2d 680, 16 USPQ2d 1430 (Fed. Cir. 1990). Further clarification of how IWAI could be modified to include the diode 124 of LI et al. and why such modification would be obvious is respectfully requested.

Claim 78 provides that the anode of the trigger device is connected with the base of the vertical bipolar transistor and the cathode is connected with the collector of the vertical bipolar transistor.

In IWAI, since the base and collector are short-circuited, if the proposed combination of references did meet the limitations of claim 78, then it would appear that the diode would also be short-circuited. A further clarification of how it would be obvious to combine the references to obtain a short-circuited diode is respectfully requested.

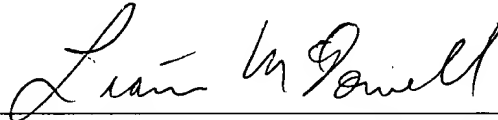
Claims 74, 75 and 77-79 depend from claim 73 and further define the invention and are also believed patentable over the cited prior art.

Withdrawn claims 80-85 depend from claim 73 and thus include all the limitations of claim 73 and further define the invention and are also believed patentable over the cited prior art. Withdrawal of the election of species requirement is respectfully requested and reconsideration and allowance of all the claims pending in the application are respectfully requested.

The Commissioner is hereby authorized in this, concurrent, and future replies, to charge payment or credit any overpayment to Deposit Account No. 25-0120 for any additional fees required under 37 C.F.R. § 1.16 or under 37 C.F.R. § 1.17.

Respectfully submitted,

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**APPENDIX:**

The Appendix includes the following item:

- replacement sheet for Figure 25

AMENDMENTS TO THE DRAWINGS:

A replacement drawing is submitted for Figure 25 changing reference numeral 11 on the far right of the figure to reference numeral 21.